AU/ACSC/2017

AIR COMMAND AND STAFF COLLEGE

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LEVERAGING SUCCESS: APPLYING INTERAGENCY LESSONS LEARNED TO THE JOINT AIR-DELIVERED NUCLEAR WEAPONS ACQUISITION PROCESS

By

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A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

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April 2017

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ABSTRACT

Effective coordination and communication between the Department of Energy (DOE) and the Department of Defense (DoD) is necessary to ensure that the nuclear weapons stockpile remains safe, secure, and effective without nuclear testing. The science-based Stockpile Sustainment Program (SSP) is the method used to sustain and maintain the nuclear stockpile throughout the weapons life cycle. A comprehensive review was conducted of the joint organizational structure, processes, and responsibilities with emphasis on one of the newest and most complex Life Extension Programs (LEPs), the B61 Mod 12 (B61-12). Interagency lessons learned, including joint military doctrine, were used to develop concepts for successful coordination and communication. A review of congressional panels, reports, and testimony, along with joint policy and guidance documents were used to explore the joint organizations. As a result of the research, a more detailed understanding of the various factors that could negatively impact coordination and communication was created. In general, a relatively robust structure is in place to support effective coordination and communication between the DOE and DoD, however, cultural differences and the integration of two separate acquisition processes remain as challenges.

PREFACE

The inspiration for this research came from taking the Joint Warfare Concentration courses as part of the Air Command and Staff College (ACSC) Online Master's Program (OLMP). During this coursework, it became apparent that a significant amount of relatively recent experience has been gained by the Armed Forces of the United States in joint operations, which required the need to effectively coordinate and communicate with interagency partners to achieve common goals and objectives. The lessons learned and experiences achieved by these very difficult and complicated coordination efforts have been recorded in joint doctrine. Using this doctrinal knowledge base and lessons learned from other interagency efforts, research was conducted into the joint DOE and DoD air-delivered nuclear weapons life cycle process to better understand how well the two organizations coordinate and communicate. Specifically, the emphasis of the research was placed on the B61-12 LEP.

INTRODUCTION

Sustaining a safe, secure, and effective nuclear arsenal is one of the key objectives of the United States (U.S.) nuclear weapons posture and is critical to achieving nuclear deterrence as part of the overall U.S. national security strategy.[1] In 1992, the United States placed a moratorium on underground nuclear testing and suspended the development of new nuclear weapons based on untested designs.[2] This led directly to Congress establishing the science-based SSP in 1993 "to sustain the credibility of the nuclear deterrent without nuclear explosive testing."[3] The DOE, through its semi-autonomous National Nuclear Security Administration (NNSA), maintains the nuclear stockpile through the SSP by individual nuclear weapon system refurbishments efforts called LEPs. Nuclear weapons in the current stockpile will cycle through the LEPs as a weapon system ages to replace degraded components, fix performance-related issues, enhance safety, or improve security. A LEP is intended to extend the life of the weapon for an additional 20 to 30 years.

In the Fiscal Year (FY) 2014 Stockpile Stewardship and Management Plan (SSMP), NNSA introduced the Nuclear Weapons Council's baseline plan and (NWC's) "3+2" strategic vision for the stockpile.[4] The NWC is a joint DoD and DOE-NNSA strategic-level organization "established to facilitate cooperation and coordination, reach consensus, and institute priorities between the two departments as they fulfill their dual-agency responsibilities for U.S. nuclear weapons stockpile management."[5] The 3+2 concept is intended to consolidate the stockpile to three ballistic missile warheads and two air-delivered systems for a total of five different warheads versus seven.[6] This strategic vision would maintain the current nuclear capability while reducing the weapon management complexity and cost for "ongoing maintenance, training, and stockpile evaluation."[7] This new strategic vision is important because executing it

will require a significant increase in coordination and communication between NNSA and DoD than previous LEPs where a single acquisition process was utilized.

The B61-12 LEP is the first of the two air-delivered systems to begin this upgrade process and will consolidate four other B61 variants (B61-3, -4, -7, and -10).[8] The responsible DoD military component is the United States Air Force (USAF). The joint NNSA and Air Force effort involves bringing separate acquisition processes, organizational cultures, policies, regulations, and funding together to develop the modified weapon system. NNSA will be responsible for upgrading the warhead located in the forward housing, or bomb assembly (BA), and the Air Force will be responsible for incorporating a guided tailkit assembly (TKA) in the aft portion of the weapon. This joint interagency LEP and the enhanced coordination and communication that will be required to complete the program and is the focus of this research paper.

Research Question

The purpose of this research is to examine how well the DOE-NNSA and DoD coordinate and communicate during the acquisition process for air-delivered nuclear weapon systems. The B61-12 LEP will be analyzed to identify if changes are needed to improve current coordination and communication efforts. This research will introduce joint military doctrinal concepts that have been learned during civil-military interagency operational experiences as well as lessons learned from case studies of successful interagency coordination efforts with intent of providing a knowledge base to view coordination and communication between NNSA and DoD during future nuclear weapon acquisition efforts.

Research Framework

The case study research framework will be used to analyze the B61-12 LEP. This research will begin by examining background information on the air-delivered nuclear weapons life cycle responsibilities, acquisition processes, organizational structure, key joint doctrinal concepts on interorganizational cooperation, and an overview of some best practices and lessons learned from other interagency successes. A follow-on analysis will be used to compare and contrast the NNSA and DoD acquisition processes to evaluate coordination and communication within the LEP. Next, a discussion will be conducted to determine if appropriate lessons learned from the interagency successes as well as any doctrinal concepts can be applied. Finally, if changes are deemed necessary to improve coordination and communication, then appropriate recommendations will be made. Recommendations that result from this case study may be used to help improve the next air delivered nuclear acquisition program, the Long-Range Stand-Off (LRSO) cruise missile. The LRSO cruise missile is expected to replace the Air-launched Cruise Missile (ALCM) and is in early development.

B61-12 LEP BACKGROUND

Most of the nuclear weapon warheads in the U.S. nuclear stockpile were produced in the 1970s and 1980s and have been retained longer than was originally planned.[9] Since the end of the Cold War, U.S. nuclear policy and guidance has changed significantly and has resulted in the elimination of nuclear testing as well as the development of nuclear warheads based on new designs. The weapons in the stockpile require ongoing surveillance and maintenance because their components deteriorate over time and require replacement with components of the same design or of a design that has been tested and verified during previous nuclear testing.[10] In order to meet the policy requirements, NNSA uses LEPs to extend the lives of nuclear warheads through the SSMP. The SSMP is updated on a yearly basis and coordinated with the DoD through the NWC.[11]

Life Cycle Responsibilities

DOE, through NNSA, and DoD share joint life cycle responsibility for all nuclear weapons in the US arsenal. The nuclear weapons life cycle is the process an individual nuclear weapon goes through from concept through production and eventually to disposal. NNSA is established by law as the government agency responsible to design, develop, produce, sustain, and dismantle nuclear weapons for the DoD.[12] They accomplish this mission through the nuclear security enterprise (NSE) that consists of four different manufacturing sites (National Security Campus, Pantex Plant, Savannah River Site, Y-12 National Security Complex) three national laboratories (Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Sandia National Laboratories) and the Nevada National Security Site test range.[13] Figure 1 depicts the general locations of the NSE across the United States. The relevance of this figure is important because coordination and communication is required between the NNSA and DoD

during the design, manufacturing, and test of the nuclear warhead at many of the individual geographically dispersed locations.

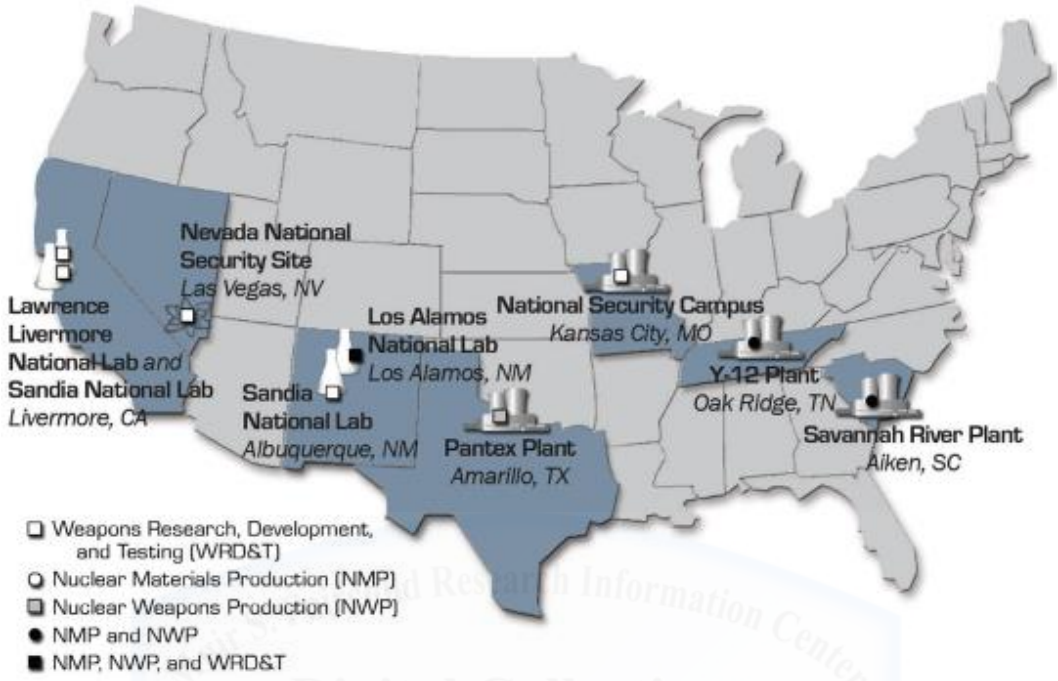

Figure 1: DOE-NNSA Nuclear Security Enterprise

Reprinted From Office of the Deputy Assistant Secretary of Defense for Nuclear Matters (ODASD(NM)), Nuclear Matters Handbook, Washington DC, 2016, 48.

The specific responsibilities for the DoD lead service component during the life cycle process is developing the requirements, specifications for nuclear warhead operational characteristics, the operational environments, the determination of design acceptability, and the military requirements for warhead quantities.[14] In addition, the DoD service component is responsible for development and acquisition of the required launch platform and delivery system.[15] Responsibilities are shared between NNSA and DoD in a number of areas that include nuclear surety, weapons maintenance and logistics, and joint testing.[16] Figure 2 provides additional details of the NNSA, DoD/AF, and joint responsibilities. In the case of B61-12 LEP, an important deviation from typical DoD responsibilities is that the delivery system is divided

between both NNSA and DoD. In addition, SNL is responsible for integrating the two subsystems as well as aircraft integration. Both of these functions were DoD responsibility areas and may require enhanced coordination and communication.

Figure 2: DOE and DoD Responsibilities in the Joint NNSA-AF Acquisition Process for Nuclear Weapons

Reprinted from Air Force Instruction (AFI) 63-103, *Joint Air Force – National Security Administration (AF-NNSA) Nuclear Weapons Life Cycle Management*, 24 September 2008, 22.

The Acquisition Processes

The Phase 6.X Process is the joint nuclear weapons life-cycle process that NNSA uses to conduct non-routine nuclear weapon alterations, LEPs, and other modernization activities on legacy warheads identified as part of SSP.[17] It is based on the original Phase 1 through 7 process that was used for the development of new and complete nuclear warheads. Phase 6.1 through Phase 6.6 are almost identical to Phases 1 through 6, but the Phase 6.X Process is only applied as part of a sustainment activity on a current nuclear weapon system. In addition, the Phase 6.X Process is very specific to the life-cycle activities dedicated to the acquisition of nuclear weapons. The Phase 6.X Process was approved by the NWC in April 2000.

As mentioned previously, the DoD participates jointly in the Phase 6.X process by defining the requirements and specifications, the operational environments, design acceptability, and quantities.[18] However, the DoD uses the DoD 5000 series acquisition process to develop, produce, and maintain the delivery system. Similar to the Phase 6.X Process, the DoD 5000 series process consists of a series of phases that make up the acquisition life-cycle. For B61-12 LEP, the TKA uses this process. The DoD 5000 series process is used by DoD for any number of military procurement items, not specifically weapon system delivery platforms.

The B61-12 LEP consists of two major subsystems, the BA and the TKA. The BA contains the nuclear warhead and is developed using the Phase 6.X acquisition process under the management of the NNSA Federal Program Office (FPO). The design of the BA will be completed using Managing and Operating (M&O) contractors at the national laboratories to include Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL). Figure 3 provides a view of the B61-12 in an early test configuration.

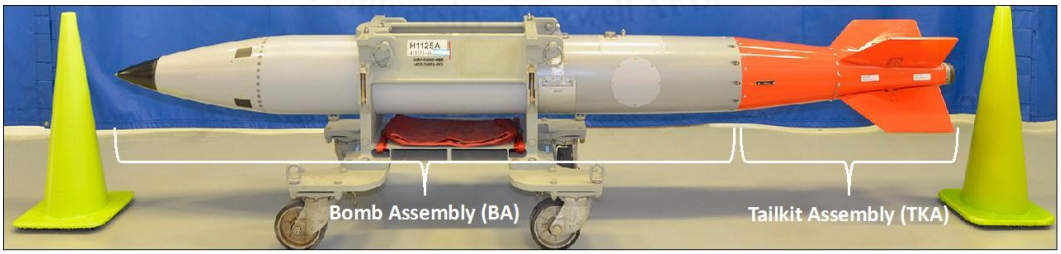

Figure 3: The B61-12 Test Unit with Identified BA and TKA

Adapted from Government Accountability Office, *Nuclear Weapons: NNSA Has a New Approach to Managing the B61-12 Life Extension, but a Constrained Schedule and Other Risks Remain*, GAO-16-218, (Washington, DC, February 2016).

The TKA contains the electronics used to guide the weapon system and is developed using the DoD 5000 acquisition process under the management of Air Force Nuclear Weapons Center (AFNWC) Nuclear Weapons Acquisition Division (NDB) System Program Office (SPO) at Eglin Air Force Base, Florida. Boeing is the prime contractor and design agent responsible for

producing the TKA design. In addition, NDB is a new division within AFNWC which resulted when it transitioned from the Air Force Life Cycle Management Center (AFLCMC) in October 2015.

The B61-12 LEP SPO is responsible for overall integration of the BA and TKA is located within AFNWC Nuclear Systems Integration Division (NDS) on Kirtland Air Force Base, New Mexico. SNL is the design agent that is responsible for integration activities and as previously mentioned, follows the Phase 6.X acquisition process.

The Organization Structure

A unique joint DOE and DoD organizational structure exists for the coordination and communication of nuclear weapon acquisition activities. This organizational structure consists of the two separate NNSA and DoD structures in addition to three other joint organizations at strategic and operational levels that bridge the gap between the two departments. The NWC provides high-level oversight and decisional guidance for all nuclear life-cycle activities. There are two subordinate organizations to the NWC that perform the day-to-day decisional matters affecting the nuclear stockpile activities. They are the Nuclear Weapons Council Standing and Safety Committee (NWCSSC) and the Action Officers Group (AOG). The NWC serves as the senior strategic-level governing body in joint NNSA and DoD life cycle activities and is chaired by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)). Although the NWC is the formal communication conduit between DOE and DoD, the working level body that coordinates lifecycle activities for a specific project is the Project Officers Group (POG).[19] An Executive Steering Group (ESG) resides in between the POG and NWC to provide executive level guidance and advocacy for the B61-12 LEP.

The POG is the operational-level organization that consists of the specific LEP program managers. In the case of B61-12 LEP, the military component that interfaces with the NNSA at the POG-level is the Air Force. The POG is the primary interface between the NNSA and USAF for the B61-12 LEP and has the "cradle-to-grave" responsibility for the nuclear weapon.

The operational-level POG must coordinate two distinct lifecycle processes. These processes consist of the Phase 6.X Process for NNSA which is responsible for the nuclear warhead and the DOD 5000 process for USAF which is responsible for the delivery platform. These processes must be coordinated through two separate and different chains of command, funding lines, and cultures. The B61-12 LEP is a multi-billion-dollar effort, and there are numerous stakeholders involved in the acquisition process to include U.S. Strategic Command (USSTRATCOM), AF Global Strike Command (AFGSC), multiple aircraft SPOs, AFNWC, NNSA Defense Programs (NA-10), and various national laboratories and plants that make up the NSE. For a program of this size and complexity, challenges will need to be overcome. The DoD conducts large acquisition programs regularly, has a mature acquisition process, and even with this knowledge of lessons learned, it has not been able to remove challenges from the acquisition process. For example, the largest program in Air Force history, the F-35 Joint Strike Fighter, has seen numerous, cost, schedule, and technical challenges that have resulted in significant restructuring of the program.[20] The challenges faced by the F-35 program are contained within a joint program structure within the DoD and can be mitigated under a unified command structure. The B61-12 LEP, although structured within a POG with a Lead Project Officer (LPO), flows out of the POG up two distinct chains of command before converging back within the NWC. A schedule delay on either side of the program will have an impact to the other side and mitigation of these delays will require concerted coordination by both departments. In the case of B61-12

LEP, a unified command structure does not exist and unified effort between the organizations may only be achieved through effective coordination and communication.

Joint Doctrinal Concepts

In joint military operations, unity of command is critical to achieving operational success. According to Joint Publication (JP) 1, *Doctrine of the Armed Forces of the United States*, unity of command is established when all forces operate under a single commander "with the requisite authority to direct all forces employed in pursuit of a common purpose."[21] The Goldwater-Nichols Department of Defense Reorganization Act of 1986 unified the chain-of-command from the geographic and functional commands up through the Secretary of Defense (SECDEF) to the President of the United States (POTUS), thus putting in place a unified command structure for conducting military operations.[22] The Goldwater-Nichols Act enabled our military forces to achieve unity of effort directly because unity of command had been established.

Achieving unity of effort in the interagency environment is more challenging because of the existence of two or more separate chains of command. The agencies are sometimes separated by leadership, policy, processes, and procedures, organizational structures, cultural differences, physical distance, and bureaucratic and personnel limitations. However, according to doctrine, unity of effort can still be achieved through "effective coordination, exchange of liaisons, and interoperable communications and/or common operating systems."[23] Unity of effort is critical to achieving operational objectives during military operations. It is arguably even more critical to achieve unity of effort in the acquisition of nuclear weapons because of the strategic implications of failing to field a nuclear weapon system.

Interdependence is another joint concept that may be applicable to the NNSA and DoD nuclear acquisition process to understand how well they coordinate and communicate.

According to doctrine, interdependence is when organizations rely on each other to employ resources to achieve an objective.[24] Colonel Christopher Paparone and James Crupi used concepts from James D. Thompson's, *Organization in Action*, to describe three different levels of joint interdependence that can be used to describe past and future military operations. The three levels from least to most complicated are pooled, sequential, and reciprocal interdependence.[25] Pooled interdependence describes organizations that operate independently but provide help in achieving a common objective. Sequential interdependence is linear in which one organization provides a part of the solution that is used by the next organization to achieve the overall objective.[26] Reciprocal interdependence involves complex coordination between organizations where inputs and outputs are traded to build solutions that ultimately achieve the objective. Figure 4 shows the three different types of interdependencies that may be used during joint operations. Pooled interdependence was used during Operation Desert Storm (ODS) and consisted mainly of joint de-confliction between the military components. During Operation Iraqi Freedom (OIF), interoperability and clear processes allowed the joint forces to add sequential interdependence to the portfolio.[27] However, the future of joint operations is using each service's capabilities through continuous communication and decision making, or a form of coordination called mutual adjustment, to achieve reciprocal interdependence.[28]

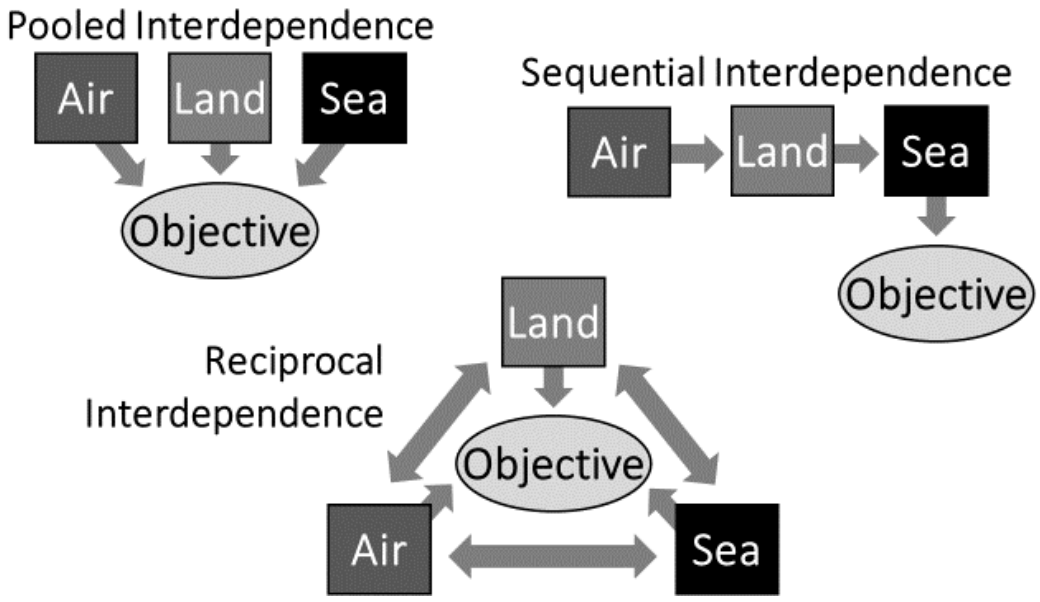

Figure 4: Three Types of Joint Interdependence

Adapted from Col Christopher Paparone and James Crupi, "What is Joint Interdependence Anyway?" Military Review (July – August 2004), 40.)

Interagency Coordination

The DOE and DoD, or their predecessors, have been involved in the business of developing nuclear weapons as a coordinated effort since the Manhattan Project in 1942. Due to a constrained fiscal environment and increased complexity that has resulted from suspended nuclear testing, the joint NNSA and DoD nuclear weapons acquisition process will need to become more efficient and effective in order to accomplish its mission. Leveraging lessons learned to improve coordination and communication may be one way that acquisition process could be improved and synergies between the two government agencies could be increased, should the analysis show any areas of needed improvement. The theme of partnering to create improved synergistic effects is occurring more often between USG agencies, especially the military. For instance, the *Capstone Concept for Joint Operations (CCJO): Joint Force 2020* identifies partnering as one of the eight key elements of globally integrated operations because

"strategic success will turn on [the ability of the DoD] to operate in concert with the rest of the U.S. government, allied governments and their armed forces, and nongovernmental partners.[29]

Interagency Best Practices

In October 2005, the Government Accountability Office (GAO) released a report that identified key practices that "can help enhance and sustain federal agency collaboration."[30] The eight collaborative mechanisms identified in the report can be used to help establish how well two agencies collaborate. In the report, collaboration was defined "as any joint activity that is intend to produce more public value than could be produced when the agencies act alone."[31] The best practices that were identified in the report are:

- define and articulate a common outcome;
- establish mutually reinforcing or joint strategies;
- identify and address needs by leveraging resources;
- agree on roles and responsibilities;
- establish compatible policies, procedures, and other means to operate across agency boundaries;
- develop mechanisms to monitor, evaluate, and report on results;
- reinforce agency accountability for collaborative efforts through agency plans and reports; and
- reinforce individual accountability through performance management systems.[32]

Implementation of these best practices requires leadership, trust, and developing a culture of collaboration.

Successful Interagency Coordination and Communication

Joint Interagency Task Force – South (JIATF-South) is considered one of the most well-known and successful interagency cooperation and intelligence fusion efforts within the U.S. Government.[33] In analyzing what made it so successful, Munsing and Lamb used "10 organizational performance variables taken from organizational and management research on cross-functional teams."[34] Effective cross-functional teams, such as JIATF-South, use reciprocal interdependence and mutual adjustment among the functional specialties on a routine and rapid basis.[35] In the case of JIATF-South, the 10 performance variables were used as organizational lenses to develop an explanation for its success and to contribute to a better understanding of how other interagency teams might be able to duplicate it. These 10 performance variables are broken into three categories consisting of organizational-, team-, and individual-level variables. Table 1 provides the variable name and definition in addition to the category. The analysis of the B61-12 LEP in the following section will consider these variables in order to determine how well the team coordinates and communicates.

Table 1: Cross-Functional Team Performance Variables

Level	Variables	Defined
Organization	Purpose	The broad, long-term mandate given to the team by its management as well as the alignment of short-term objectives with the strategic vision and agreement on common approaches within the team.
	Empowerment	Access to sufficient high-quality personnel funds, and materials, and an appropriate amount of authority that allows for confident, decisive action.
	Support	The set of organizational processes that connect a team to other teams at multiple levels within the organization, other organizations, and a wide variety of resources the team needs to accomplish its mission.
Team	Structure	The "mechanics" of teams - design, collocation, and networks - that affect team productivity.
	Decision-making	The mechanisms that are employed to make sense of and solve a variety of complex problems faced by a cross-functional team.
	Culture	The shared values, norms and beliefs of the team - behavioral expectations and level of commitment and trust among team members.
	Learning	An ongoing process of reflection and action through which teams acquire, share, combine, and apply knowledge.
Individual	Composition	What individual members bring to the group in terms of skill, ability, and disposition.
	Rewards	Material incentives and psychological rewards to direct team members towards accomplishment of the team's mission.
	Leadership	The collection of strategic actions that are taken to accomplish team objectives, and to avoid team catastrophes.

Adapted from Evan Munsing and Christopher J. Lamb, Joint Task Force-South: The Best Known, Least Understood Interagency Success, Institute for National Strategic Studies, Strategic Perspectives, No.5 (Washington, DC: National Defense University Press, June 2011), 33.

ANALYSIS OF B61-12 LEP

In the JIATF-South analysis identified in the previous section, Munsing and Lamb related the three different categories (organization, team, and individual) for the 10 performance variables to a vessel sailing on the ocean.[36] The organizational-level variables (purpose, empowerment, and support) represent the wind and weather and the conditions the vessel operates under.[37] The team-level variables (structure, decision-making, culture, and learning) represent the ship and its basic structure and mechanisms it uses to operate.[38] The individual-level variables (composition, rewards, and leadership) represent the ship's crew members, which are the micro determinants of performance that can have a major impact of coordination and communication within the organization.[39] The organizational, team, and individual variables will be used to analyze the B61-12 LEP to help determine how well the different organizations communicate.

NWC Coordination and Communication

The strategic-level joint NNSA and DoD organizational structure for the B61-12 LEP consists of the NWC and its support committees. The support committees are the executive-level NWCSSC and the working-level AOG. The NWC is responsible for evaluating, maintaining, and ensuring the safety, security, and control of the nuclear weapons stockpile.[40] In addition, the National Defense Authorization Act (NDAA) for FY 2013 added the additional responsibility to annually certify the sufficiency of the NNSA budget to meet the stockpile requirements.[41] The NWC facilitates coordination and communication between the NNSA and DoD to identify stockpile issues, reach consensus on those issues, and align their efforts to carry out their joint responsibilities.[42]

The FY13 NDAA also established a Congressional Advisory Panel on the Governance of the Nuclear Security Enterprise (Augustine-Mies Panel) whose purpose was to examine options and make recommendations for revising the governance structure, mission, and management of the nuclear security enterprise.[43] The Augustine-Mies Panel reported its results in November 2014 and noted at the outset that there is "no question as to the efficacy of the nuclear deterrent for the foreseeable future" and the nuclear stockpile is "safe, secure, and reliable, and the quality of science and research is undiminished."[44] However, the panel found that the "existing governance structures and many of the practices of the enterprise are inefficient and ineffective, thereby putting the entire enterprise at risk over the long term."[45] Overall, the report made 19 primary recommendations and 63 sub-recommendations to improve performance, efficiency, and accountability. The recommendations revolved around five main challenges: strengthen national leadership focus, direction, and follow-through; solidify cabinet secretary ownership of the mission; adopt proven management practices to build a culture of performance, accountability, and credibility; maximize the contributions of the M&O organizations to the safe, secure execution of the mission; strengthen customer collaboration to build trust and a shared view of mission success.[46]

The first challenge is related to the loss of focus by U.S. leadership as a whole since the end of the Cold War. The report bluntly stated that "nuclear weapons have become orphans in both the Executive and Legislative branches."[47] The panel recommended that the branches adopt new mechanisms designed to set enterprise priorities and program expectations, demand feasible plans for the enterprise, assure adequacy of assigned resources, and advance needed governance reforms.[48] In addition, the panel recommended that Congress strengthen committee oversight and unify support to enable improved coordination across the different nuclear missions,

authorizers, and appropriators thus allowing enhanced focus.[49] The loss of focus by national leadership can have negative impacts on all of the organizational-level performance variables (purpose, empowerment, and support) at the highest levels of government and can have ripple effects throughout all missions within the nuclear security enterprise.

Recent comments from Defense Secretary Carter, however, emphasizes the importance of the nuclear mission and identifies nuclear deterrence as the highest priority mission of the DoD.[50] There are positive signs that bipartisan support exists in House Armed Services Committees Strategic Forces Subcommittee where Chairman Mike Rogers (R-AL) and the ranking Democrat Representative Jim Cooper (D-TN) provided support for the nuclear mission.[51] At a Senate Armed Services Committee Strategic Forces Subcommittee for the FY17 Defense Authorization Request, Chairman Jeff Sessions (R-AL) acknowledged the bipartisan support from the House Armed Services Committee and stated "these programs are the Department's top priority and are going to be fully funded on a bipartisan basis."[52] This indicates that the nuclear programs, including the B61-12 LEP, are supported at the highest levels of the U.S. Government. These three specific examples show the importance of the nuclear mission and a unified and restored focus by national leadership. The Executive and Legislative branches, have empowered the NNSA and DoD, and fully support the nuclear missions. The top-down efforts are important ingredients for maintaining strong organizational partnerships.

The second major challenge area identified by the Augustine-Mies Panel was to solidify the cabinet secretary ownership of the nuclear security mission because the DOE and NNSA headquarters were not properly aligned with mission needs.[53] The NNSA Act of 2001 created NNSA in order to insulate it from DOE headquarter staff as a separately organized entity. The

Act, however, failed to specify the Secretary's roles, stipulate the relationship between NNSA and DOE headquarter staffs, and did not require actions to shift culture to one focused on mission performance.[54] This issue was not related directly to how well DOE and DoD coordinate and communicate, but could result in a leadership disconnect at the highest DOE-NNSA levels and would result in a break in unity of effort. This disconnect could have negative impacts on B61-12 LEP coordination and communication at both the NWC and POG levels. Although this issue is important, further analysis is outside the focus of this research.

The third major challenge area is that DOE-NNSA lacks a unifying focus on mission deliverables, is risk averse, has poorly defined chains of command, and has inadequate personnel management.[55] The fourth major challenge area is related to a reduction of open communication and collaboration between M&O contractors and Federal officials due to erosion of trust in the Federally Funded Research and Development Center (FFRDC) relationship.[56] Once again, both of these challenges could indirectly impact coordination and communication within the B61-12 LEP and impact overall unity of effort, but further analysis is outside the scope of this research effort.

The fifth and final challenge area is directly related to coordination and communication issues between the NNSA and DoD primarily within the NWC, the NWCSSC, and the AOG. The panel identified trust issues between the NNSA and DoD because of a history NNSA over-promising and under-delivering.[57] In general, the panel concluded that the DoD lacked confidence in the ability of NNSA to execute LEPs because there was no affordable, executable, joint DOE and DoD vision, plan, or program for developing nuclear deterrence capabilities.[58] The Panel identified difficulties within NWC for working out details on a baseline plan that involved aligning DoD's warhead and delivery platform needs for the next three decades, the

NNSA infrastructure required to support the needs, and the 3+2 plan for the long-term stockpile sustainment. Although attempts have been made to establish better communication, more disciplined staff processes, and closer follow up, "the processes supporting the NWC have been unable to achieve the collaboration required to build consensus or to systematically frame issues at the working levels across the Departments."[59]

The panel concluded that NNSA has a history of unreliable planning and cost estimating, which led to a series of budget shortfalls and cost growth within programs.[60] In developing a path forward on the 3+2 concept, the DoD agreed to contribute $12 billion in proposed budget authority to NNSA over multiple years by signing a Memorandum of Agreement (MOA) for a one-time transfer.[61] Since this time, NNSA has experienced budget shortfalls, mainly from significant cost growth in their programs.[62] The budget shortfalls resulted in delays to the programs and NNSA could not provide an acceptable level of visibility to how the DoD funds were managed.[63] These failures and the resulting perceptions of how the DoD money was managed "have exacerbated tensions and further undermined trust in the DOE-NNSA and DoD relationship."[64]

The NNSA's response to the Augustine-Mies Panel identified the root cause of the strained relationship between NNSA and DoD resulted from increased pace of LEPs, aging manufacturing facilities, and the challenges of maintaining the stockpile without explosive nuclear testing.[65] The tensions between the organizations were further exacerbated "by significant budget pressures and misunderstandings about the roles and responsibilities of each agency."[66] Many of the comments from the Panel referenced DoD as the "customer", which NNSA took exception to by noting that both agencies have "synergistic responsibilities" in maintaining U.S. national security. NNSA also identified that current relationship is "more

open, with extensive, detailed and transparent discussions, and a better understanding of what each agency needs to meet the requirements of the nuclear mission."[67] In addition, it stated that both agencies had "moved to a more complete understanding of the relationship, their respective missions and the role of the NWC."[68]

A key reform advocated by the Augustine-Mies Panel as well as other external reviews was to establish a trusted independent cost and resource analysis capability within NNSA. The FY14 NDAA amended the NNSA Act to establish an Office of Cost Estimating and Program Evaluation (CEPE). CEPE developed its implementation plan in coordination with Office of the Secretary of Defense (OSD) Cost Assessment and Program Evaluation (CAPE) and in consultation with Congressional staff.[69] This process improvement should help NNSA provide independent cost estimates (ICEs) of LEPs and other activities in addition to planning for future-years nuclear security program budgets. In general, the implementation of this process improvement should resolve trust issues between DoD and NNSA with regards to visibility of how funds are managed.

The NNSA has identified that tensions have abated and the relationship between the two organizations is on a good path where each agency has better understanding the others needs to meet the requirements of the nuclear mission.[70] A GAO report in May 2015 identified that the NWC actions to coordinate NNSA's and DoD's stockpile responsibilities are generally consistent with key best practices for interagency collaboration except for two areas revolving around agreement on roles and responsibilities and regularly including all participants at subcommittee meetings.[71] The 1997 MOA that documents NWC's processes and the two support committees' roles and responsibilities has not been updated to reflect changes in the NWC structure. In addition, DoD and NNSA budget and program evaluation officials have not

attended the support committee meetings even though the NWC is responsible for certifying the sufficiency of the NNSA budget. Formal documents are most effective when regularly updated and monitored and are important for articulating agreements between agencies that can strengthen their commitments to interagency collaboration.[72] Both of these key practices are critical for building an effective cross-functional team whose purpose is in alignment and provides the support in terms of processes and guidance that enable the organizations to coordinate and communicate at a rapid pace. The NWC and its two support committees are reciprocally interdependent organizations that rely on mutual adjustment to accomplish the nuclear deterrence mission.

POG Coordination and Communication

The POG membership includes the NNSA Federal Program Manager (FPM), the B61-12 TKA Program Manager (PM), and the B61-12 LPO. Two acquisition processes are used in the B61-12 LEP, which require synchronization throughout the program life cycle. The Phase 6.X Process is used for the development, production, and sustainment of the BA and the DOD 5000 acquisition process is used for the development, production, and sustainment of the TKA. Furthermore, the Phase 6.X Process is used for the integration of the BA and TKA into an All Up Round (AUR). Policy documents, such as DODI 5030.55 and AFI 63-103, provide good guidance on how DoD and Air Force conducts joint nuclear life cycle activities with NNSA through the Phase 6.X Process.[73,74] However, the overall structure of the B61-12 LEP is complicated with members of the program spread across multiple organizations, locations, and cultures. A further complicating factor is that the NNSA and DoD use entirely different contracting processes to select their design agents. With all of these differences, effective coordination and communication is a challenge to achieve between NNSA and the Air Force.

Culture plays a key role in how well the various B61-12 LEP organizations coordinate and communicate. The Air Force portion of the B61-12 LEP was created in a dynamic environment that initially included divisions within AFLCMC Armament Directorate (EB) at Eglin AFB and AFNWC Air Delivered Capabilities Directorate (ND) at Kirtland AFB. The Armament Directorate Strategic Systems Division (AFLCMC/EBB), which included the B61-12 TKA SPO, was created within a conventional air delivered weapons acquisition organization. The Air Delivered Capabilities Directorate Nuclear Weapons Systems Integration Division (AFNWC/NDS), which includes the B61-12 LEP SPO, is responsible for delivering, sustaining and supporting air-delivered nuclear weapon systems. In October 2015, AFLCMC/EBB merged with AFNWC/NDB combining the B61-12 LEP under a single directorate. The TKA SPO has extensive experience acquiring conventional air-delivered weapons within the DOD 5000 series acquisition process. The LEP SPO has extensive experience working with NNSA and their M&O contractor base using the Phase 6.X Process. These two distinct Air Force cultures are geographically isolated by over 1300 miles. The differences between the two organizations, could have a tendency to act as barriers in the development of a positive team culture. A basic indicator of strong culture is cohesion, which can be assessed by member commitment to the mission.[75] It takes time for team members to overcome parochial views, learn to appreciate diverse perspectives, and to become committed to working as an integrated unit in achieving the team purpose.[76] A communication structure is in place that includes teleconferencing and shared information networks, which can at least partially offset geographic dispersion.[77]

The B61-12 NNSA FPO is located within the NNSA Sandia Field Office in Albuquerque, NM. Although cultural differences exist between NNSA and the Air Force in general, the close proximity of NNSA B61-12 FPO, as well as SNL, and the B61-12 LEP SPO provides for a

favorable environment to build a cohesive team environment. In addition, AFNWC and NNSA have previous experience working on previous LEPs within the Phase 6.X Process.

Cultural challenges exist between the B61-12 TKA and NNSA B61-12 FPO for many of the same reasons as between the TKA and LEP SPO described previously. However, other differences exist between the organizations such as contractor management. For instance, the Air Force selected Boeing as the prime contractor for the TKA through a competitive bidding process using an established industrial defense contractor base, while NNSA does not have that option because it is not feasible to maintain such a base due to the sensitive nature of dealing with special nuclear materials. Because of this, there is no formal bidding process within the M&O laboratories, and SNL and LANL were selected to work on the B61 LEP without a competitive process. This special relationship between NNSA and its contractors results in less oversight and increased levels of responsibility for the M&O contractors. For example, the NNSA budget for the B61-12 LEP is approximately $8.1 billion with 20 federal officials assigned to manage the work, while the Air Force budget for the B61-12 LEP is $1.6 billion with 93 federal officials.[78] That results in a management effort of about $400M per NNSA official and about $17M per Air Force official. This does not imply that NNSA is 24 times more efficient in how they operate, it means that the management of the work is pushed down to the M&O contractors. What this implies is that the M&O design agents for the BA (SNL and LANL) are able to execute the program with relatively little oversight from NNSA, while the prime contractor for the TKA (Boeing) must coordinate program execution with relatively heavy oversight from the Air Force. The difference in how the government manages the contractors could generate misunderstandings that could ultimately impact coordination and communication between the Air Force and NNSA as well as between the contractors themselves.

For the DoD 5000 series acquisition system, the capability requirements, and the budgeting used to acquire products are "closely related and must operate simultaneously with full cooperation and in close coordination."[79] Also, the Join Requirements Oversight Council (JROC) assesses and validates the requirements through the Joint Capabilities Integration and Development System (JCIDS) as requirements mature through the life cycle of the system.[80] In the case of B61-12 TKA, the requirements flowed through this process initially, but after negotiation and agreement between the three organizations, the requirements took a joint path and joined together with Military Characteristics (MC) and Stockpile to Target Sequence (STS) requirements of the Phase 6.X Process in a document called the Integrated Requirements Document (IRD). The requirements for each organization exited the IRD and flow through a combined Phase 6.X and POG-created requirements flow that ended up with a three volume Bomb Assembly to Tailkit Assembly Interface Control Document (BTICD) before splitting into a bi-directional requirement flow to the separate BA and the TKA system requirement documents. This new process was essentially created as the program was underway and has resulted in numerous requirement gaps. Finally, the joint flow separated the requirements from the acquisition and budgeting processes which has created additional challenges. Changes that impact structure of the teams can impact team productivity and can result in the need for increased coordination and communication. It is important that changes to either organizations processes be minimized, if possible, or studied and understood well in advance of implementation and that lessons learned are incorporated back into the process to fix problems as they arise during implementation. A formal lesson learned program exists within the B61-12 LEP that provides feedback to the POG on a regular basis.

The decision-making body for the B61-12 LEP is the POG. Much like how the NWCSSC and AOG conduct the daily work for the NWC to make decisions, the various subgroups conduct the daily work for the POG to make programmatic decisions. The chairs and co-chairs of the various groups are represented by members from within the individual program offices. Safety is the only mandatory subgroup, but others may be formed by the POG to meet particular needs such as maintenance and logistics, requirements, joint test, surety and reliability, integration, and use control.[81] Eight different subgroups represent the various needs for the B61-12 LEP. The structure of the subgroups is well defined through the different documents owned and generated by the subgroups. There is a significant effort and overhead required to manage coordination and communication required by the subgroups while balancing the needs of the product development for either the BA or TKA. Perhaps this challenge is enhanced within the B61-12 TKA SPO, whose members have the acquisition expertise required to work within the DoD 5000 process with a primary focus of product development and contractor performance, but do not necessarily have the expertise required to work within the interagency environment and establish the teamwork and trust required to propel the mission forward. Compile this with the fact that there appear to be many more Air Force government officials available to coordinate within the subgroup structure, which could result in potential misunderstandings and frustrate both government organizations.

DISCUSSION OF B61-12 LEP CASE STUDY RESULTS

In general, the B61-12 LEP analysis shows that many of the interagency best practices and performance variables are in place for the development of successful joint cross-functional teams across all levels of the joint NNSA-DoD organizations with a few observations and areas of needed improvement.

The Augustine-Mies Panel identified a number of issues in five broad categories that could challenge effective coordination and communication between the DOE and the DoD for air delivered nuclear weapon systems. Categories two through four were identified as having indirect effect on coordination and communication and were outside the scope of this research effort. It was identified that a strong and unified national leadership is critical to perform the essential roles of strategy formulation, guidance, resources, as well as, communicating "a consistent narrative to shape relationships among the Departments."[82] Based on the analysis, it is apparent that Executive and Legislative leadership have taken many of the necessary steps required to ensure that the NWC, NNSA, and DoD are empowered and supported with renewed purpose. The final category of the Augustine-Mies Panel identified trust issues between the NNSA and DoD due to an inability to settle on a plan for developing a nuclear deterrence capability and NNSA's inability to accurately project costs, which resulted in consistent budget shortfalls. Since the report came out, NNSA has made improvements in program management and all of the current LEPs are on schedule and within budget.[83] The implementation of the CEPE has led to better mission planning, budgeting, and performance.[84] The MOA between DOE and DoD, however, has not been updated to document roles and responsibilities or the need for budget officials to attend NWC meetings. The DoD responded to the GAO report by stating that a letter would be sent to the NWC members by the NWC chairman indicating the updated

roles and responsibilities as well as budget and program evaluation officials would be required to attend NWC and support committee meetings.[85] The reason stated was that the NWC wished to maintain flexibility, but the processes on how the NWC and the support committees operate should be documented and regularly updated so that all members have clear understanding of how the groups coordinate and communicate.

The structure of the POG is well documented for conducting the B61-12 LEP through the Phase 6.X process. A number of challenges arise with the introduction of the DoD 5000 series process within the same design environment. The most significant challenge may be indirectly related to the introduction of the DoD 5000 acquisition process and has more to do with cultural differences between the organizations. The differences between the B61-12 TKA SPO and both the B61-12 LEP SPO and the B61-12 NNSA FPO appear to be most prominent because of the conventional air delivered weapon development versus nuclear weapon development background, geographic isolation, and differences in the government and contractor management. With the addition of the DoD 5000 series process and the need for managing two separate requirements flow processes, compromises by all three POG-level organizations resulted in a less than optimal solution. The subgroups are critical for solving the complex problems that arise between the organizations. Working within the subgroup structure requires striking a balance between managing the organizations product development and managing the needs across the individual program offices. The B61-12 TKA SPO has a large number of personnel, but it is staffed to provide the necessary level of contractor oversight for the TKA development. The overhead required to manage a separate subgroup structure is a new concept to the personnel that have spent their careers within the DoD 5000 series Integrated Product Team (IPT) structure.

CONCLUSION AND RECOMMENDATIONS

The B61-12 LEP is the most complex joint LEP effort undertaken to date with its broad scope and narrow time frames and future life extension programs are likely to be even more complex.[86] The mission is strategically important and it is clear that both the NNSA and the Air Force will need inspired leadership to overcome future challenges. It is important that the NWC and its subcommittees, the ESG, and the POG and its subgroups work in an environment of teamwork and trust and continue to learn to develop and embrace a high-level of interdependence required to accomplish the overall mission. Currently, coordination and communication between the DOE and DoD is adequate but improvements can and should be made. An emphasis should be place on building cross-functional teams that achieve a high-level of interdependence throughout the joint organizational structure. Members of each organization should understand that success is not achieved through the success of a single organization but by the combined success of both organizations.

Challenges remain that complicate effective coordination and communication. Overall, the framework is in place but the integration of the two acquisition processes needs to be completed. The most significant challenge related to the acquisition process is the requirements flow between the two processes. The requirements flow has generated confusion by both organizations due to a bi-directional flow between requirements documents.

Cultural differences also exist between NNSA and the Air Force. The greatest differences, however, exist between the B61-12 TKA SPO and both the B61-12 LEP SPO and the B61-12 NNSA FPO. This is primarily due to the conventional weapon development background versus the nuclear weapon development, geographic isolation, and differences in contractor management.

Recommended Changes to Improve Coordination and Communication

The NWC should formally document the processes used in the NWC and the support committees to clearly identify the roles and responsibilities of all joint organizations so that any confusion is removed and a clear focus of objectives is understood. The organizational structure directly impacts team productivity and undermines effective coordination and communication.

Joint cultural training should be established that provides answers to the questions of why each organization operates the way that it does. Typically, there are very good reasons for the decisions that are made in daily operations. Without a good understanding of where the organization came from and even where they want to go, it is sometimes difficult to relate to the decisions that are made. It is important to keep in mind that members from each organization are made of dedicated hard-working professionals who are committed to their mission. Trust needs to be established between members of each organization and joint training may be a good first step. In addition, considerations should be made for a program office liaison officer who is an expert in their organizations acquisition processes. An empowered liaison officer could help enhance coordination and communication and more importantly build trust between the organizations.

Recommendation for Additional Research

The requirements flow down process used on the B61-12 LEP is convoluted and based on compromises that removed critical elements such as JCIDS from the process. There is no obvious straightforward answer on what the solution should be. Requirements experts from both the Phase 6.X and the DoD 5000 series acquisition process should research the issue and provide recommendations for a clear path forward.

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